

Claims

1. A thermal airflow meter comprising:

a flow-rate measuring element which includes a heat resistor and a temperature-compensating resistor, for use in measuring an airflow rate, provided on a substrate thereof; and a casing for holding the flow-rate measuring element and housing at least a drive circuit of the flow-rate measuring element, wherein the flow-rate measuring element is disposed in an air passage for airflow rate measurement with the casing,

10 said thermal airflow meter further comprising:

a first temperature sensor and a second temperature sensor for measuring temperature at each of two points in the thermal airflow meter, respectively,

wherein the first temperature sensor is provided on the substrate of the flow-rate measuring element, and the second temperature sensor is provided inside the casing.

2. The thermal airflow meter according to claim 1,

wherein the flow-rate measuring element is a semiconductor element being provided with the heat resistor and the temperature-compensating resistor which are formed by patterning on a semiconductor substrate,

a circuit board with at least the drive circuit formed thereon is housed in the casing,

25 the first temperature sensor is provided over the

semiconductor substrate of the flow-rate measuring element, and the second temperature sensor is provided over the circuit board inside the casing.

5 3. The thermal airflow meter according to claim 1,

 wherein the second temperature sensor is provided on a circuit board disposed inside the casing, the substrate having the first temperature sensor is electrically connected to a circuit board having the second temperature sensor via terminal
10 electrodes, the circuit board is provided with a signal processor for receiving an output signal of the flow-rate measuring element and respective output signals of the first and second sensors, and computing an airflow rate on the basis of those signals.

15 4. The thermal airflow meter according to claim 3, wherein

the circuit board is provided with a memory for storing correction data for use in airflow rate computation by the signal processor.

20 5. The thermal airflow meter according to claim 3, wherein

the signal processor estimates an air temperature and an intake air passage wall face temperature on the basis of the respective output signals of the first and second sensors and the output signal of the flow-rate measuring element, and obtains

25 correction data for airflow rates from the estimated air

temperature and intake air passage wall face temperature, and computes an airflow rate by use of the correction data.

6. The thermal airflow meter according to claim 1, wherein
5 the airflow meter has a secondary passage for allowing a portion of air flowing through a main air passage to pass, the secondary passage is held by the casing, and the secondary passage and the casing are inserted through the wall of the main air passage in the radial direction of the air passage to be disposed inside
10 the main air passage;

the substrate of the flow-rate measuring element being positioned in the secondary passage, and the first temperature sensor being provided over the substrate of the flow-rate measuring element;

15 a circuit board with the drive circuit of the flow-rate measuring element, a signal processor and the second temperature sensor, being housed in the casing.

7. A thermal airflow meter comprising:

a first base member being disposed in an air passage,
20 and having a heat resistor for airflow rate-measurement and a temperature-compensating resistor;

a second base member having a circuit for driving the heat resistor and the temperature-compensating resistor, and a signal processor for computing an airflow rate;

25 wherein the first base member and the second base member

are sequentially disposed in the radial direction of the air passage via electrical connection, and the second base member is housed in a casing which is inserted into the air passage through the wall of the air passage, while the first base member is held at one extremity of the casing, and said thermal airflow meter further comprising:

a first temperature sensor and a second temperature sensor for measuring temperature at each of two points in the thermal airflow meter, respectively, provided on the first and second base members,

wherein a flow-rate measuring signal and respective output signals of the first and second sensors are inputted to the signal processor of the second base member, and the airflow rate is computed on the second base member on the basis of those signals.

8. A thermal airflow meter for measuring a flow rate of air flowing through an intake air passage of an internal combustion engine, by using a heat resistor and a temperature-compensating resistor which have temperature-dependence; the thermal airflow meter comprising:

a first base member with the heat resistor and the temperature-compensating resistor which making up a flow-rate measuring element;

a first temperature sensor provided on the first base member for measuring temperature thereon;

a second base member having a circuit for driving the heat resistor and the temperature-compensating resistor, and a signal processor for computing the airflow rate;

a casing installed at the wall of the intake air passage
5 so as to be disposed in the intake air passage and holding the first base member at one extremity thereof while housing the second base member therein;

a second temperature sensor disposed on the second base member for measuring temperature thereon; and

10 terminal electrodes disposed on the first and second base members, respectively, for electrical connection between electrical operation elements provided on the respective substrates,

wherein the signal processor of the second base member
15 has a function of receiving an output signal from the flow-rate measuring element and respective output signals from the first and second sensors to thereby compute the airflow rate on the basis of those signals.

9. The thermal airflow meter according to claim 8, wherein
20 the airflow meter is configured so that the airflow rate signal computed by the signal processor inside the casing is outputted to an engine control unit disposed outside the thermal airflow meter.

10. The thermal airflow meter according to any one of
25 claims 1 to 9, wherein the temperature-compensating resistor

doubles as the first temperature sensor.